

IN THE CLAIMS

Please add new Claim 29, to read as follows.

1. (Previously Presented) A liquid ejection recording head for effecting recording by ejecting a first liquid and a second liquid which is a different liquid through different ejection outlets, while bi-directionally scanning a recording material in a scanning direction, comprising:

a first group of ejection outlet arrays each of which has a plurality of ejection outlets at predetermined intervals arranged in a direction different from the scanning direction; and

a second group of ejection outlet arrays each of which has a plurality of ejection outlets at predetermined intervals arranged in a direction different from the scanning direction, said second group being disposed adjacent to said first group,

wherein said first ejection outlet array group includes a first ejection outlet array for ejecting the first liquid and a second ejection outlet array for ejecting the second liquid,

wherein corresponding ejection outlets in said first ejection outlet array and in said second ejection outlet array are aligned in the scanning direction and are adjacent to each other, respectively,

wherein said second ejection outlet array group includes a third ejection outlet array for ejecting the first liquid and a fourth ejection outlet array for ejecting the second liquid,

wherein corresponding ejection outlets in said third ejection outlet array and in said fourth ejection outlet array are aligned in the scanning direction, respectively, and wherein said first ejection outlet array group and said second ejection outlet array group are disposed such that said first ejection outlet array and said third ejection outlet array are adjacent to each other and such that the ejection outlets of said first ejection outlet array and the ejection outlets of said third ejection outlet array are disposed with a deviation in a direction of arrangement of the ejection outlets so as to be complementary to each other in the scanning direction.

2. (Previously Presented) A liquid ejection recording head according to Claim 1, further comprising a common liquid chamber for supplying the first liquid to said first ejection outlet array and to said third ejection outlet array.

3. (Previously Presented) A liquid ejection recording head according to Claim 1, wherein said first ejection outlet array group and said second ejection outlet array group are provided with ejection outlet arrays for ejecting a third liquid which is different from the first liquid and from the second liquid.

4. (Previously Presented) A liquid ejection recording head according to Claim 3, wherein the first liquid is yellow ink, and the second and third liquids are cyan ink and magenta ink.

5. (Previously Presented) A liquid ejection recording head according to Claim 1, wherein the ejection outlet arrays of said first ejection outlet array group and said second ejection outlet array group are arranged such that ejection outlet arrays for ejecting any given kind of liquid are symmetrically disposed with respect to said first and third ejection outlet arrays.

6. (Previously Presented) A liquid ejection recording head according to Claim 1, further comprising a fifth ejection outlet array for ejecting a liquid different from the liquids ejected from said first and second ejection outlet arrays.

7. (Previously Presented) A liquid ejection recording head according to Claim 6, wherein the liquid ejected from said fifth ejection outlet array is black ink.

8. (Previously Presented) A liquid ejection recording head according to Claim 1, wherein said first ejection outlet array group and said second ejection outlet array group are provided on one orifice plate.

9. (Previously Presented) A liquid ejection recording head according to Claim 1, further comprising a plurality of energy conversion element array groups for ejecting the first liquid from said first ejection outlet array group and a plurality of energy conversion element array groups for ejecting the second liquid from said second ejection outlet array group.

10. (Previously Presented) A liquid ejection recording head according to Claim 9, further comprising a substrate having a crystal face orientation of a <100> plane, on which substrate said ejection outlets and said energy conversion element array groups are disposed.

11. (Previously Presented) A liquid ejection recording head according to Claim 9, further comprising a substrate having a crystal face orientation of a <110> plane, on which substrate said ejection outlets and said energy conversion element array groups are disposed.

12. (Previously Presented) A liquid ejection recording head according to Claim 10 or Claim 11, wherein said substrate is provided with a plurality of through-holes for supplying the liquids to said ejection outlet arrays, and said through-holes are formed by anisotropic etching.

13. (Previously Presented) A liquid ejection recording head according to Claim 8, wherein said orifice plate is made of a photosensitive epoxy resin material.

14. (Previously Presented) A liquid ejection recording head according to Claim 9, wherein said energy conversion element array groups are groups of electrothermal transducers for generating thermal energy for ejecting the liquids from said ejection outlets.

15. (Previously Presented) A liquid ejection apparatus comprising a carriage for carrying a liquid ejection recording head as claimed in Claim 1.

16. (Previously Presented) A liquid ejection recording head for effecting recording by ejecting a first liquid and a second liquid which is a different liquid through different ejection outlets, while bi-directionally scanning a recording material in a scanning direction, comprising:

an orifice plate provided with a plurality of ejection outlet arrays each having a plurality of ejection outlets arranged at predetermined intervals in a direction different from the scanning direction; and

an element substrate having energy conversion elements, disposed corresponding to said ejection outlets of said orifice plate, for ejecting the liquids, liquid supply paths for supplying the liquids to said ejection outlet arrays of said orifice plate, and a driving circuit for driving said energy conversion elements,

wherein said ejection outlet arrays include a first ejection outlet array for ejecting the second liquid, a second ejection outlet array for ejecting the first liquid, a third ejection outlet array for ejecting the first liquid and a fourth ejection outlet array for ejecting the second liquid,

wherein, in the scanning direction, said first ejection outlet array is disposed adjacent to said second ejection outlet array, said second ejection outlet array is disposed adjacent to said third ejection outlet array, and said third ejection outlet array is disposed adjacent to said fourth ejection outlet array,

wherein a supply passage for supplying the first liquid supplies the first liquid to said second ejection outlet array and said third ejection outlet array,

wherein corresponding ejection outlets in said first ejection outlet array and in said second ejection outlet array are aligned in the scanning direction, respectively, and
wherein corresponding ejection outlets in said third ejection outlet array and in said fourth ejection outlet array are aligned in the scanning direction, respectively.

17. (Previously Presented) A liquid ejection recording head according to Claim 16, wherein said energy conversion elements are electrothermal transducer elements for generating thermal energy for ejecting the liquids from said ejection outlets.

18. (Previously Presented) A liquid ejection apparatus comprising a carriage for carrying a liquid ejection recording head as claimed in Claim 16.

19. (Previously Presented) A liquid ejection recording head for effecting recording by ejecting a first liquid and a second liquid which is a different liquid through different ejection outlets, while bi-directionally scanning a recording material in a scanning direction, comprising:

a first group of ejection outlet arrays each of which has a plurality of ejection outlets at predetermined intervals arranged in a direction different from the scanning direction;

a second group of ejection outlet arrays each of which has a plurality of ejection outlets at predetermined intervals arranged in a direction different from the scanning direction, said second group being disposed adjacent to said first group; and

a plurality of energy conversion element array groups for ejecting liquid from said first ejection outlet array group and a plurality of energy conversion element array groups for ejecting liquid from said second ejection outlet array group,

wherein said first ejection outlet array group includes a first ejection outlet array for ejecting the first liquid and a second ejection outlet array for ejecting the second liquid,

wherein corresponding ejection outlets in said first ejection outlet array and in said second ejection outlet array are aligned in the scanning direction and are adjacent to each other, respectively,

wherein said second ejection outlet array group includes a third ejection outlet array for ejecting the first liquid and a fourth ejection outlet array for ejecting the second liquid,

wherein corresponding ejection outlets in said third ejection outlet array and in said fourth ejection outlet array are aligned in the scanning direction, respectively, and

wherein said first ejection outlet array group and said second ejection outlet array group are disposed such that said first ejection outlet array and said third ejection outlet array are adjacent to each other and such that the ejection outlets of said first ejection outlet array and the ejection outlets of said third ejection outlet array are disposed with a deviation in a direction of arrangement of the ejection outlets so as to be complementary to each other in the scanning direction.

20. (Original) A liquid ejection recording head according to Claim 19, wherein said energy conversion element array groups are groups of electrothermal transducers for generating thermal energy for ejecting the liquids from said ejection outlets.

21. (Original) A liquid ejection apparatus comprising a carriage for carrying a liquid ejection recording head as claimed in Claim 19.

22. (Previously Presented) A liquid ejection recording head for effecting recording by ejecting a first liquid and a second liquid which is a different liquid through different ejection outlets, while bi-directionally scanning a recording material in a scanning direction, comprising:

a first group of ejection outlet arrays each of which has a plurality of ejection outlets at predetermined intervals arranged in a direction different from the scanning direction; and

a second group of ejection outlet arrays each of which has a plurality of ejection outlets at predetermined intervals arranged in a direction different from the scanning direction, said second group being disposed adjacent to said first group,

wherein said first ejection outlet array group includes a first ejection outlet array for ejecting the first liquid and a second ejection outlet array for ejecting the second liquid,

wherein corresponding ejection outlets in said first ejection outlet array and in said second ejection outlet array are aligned in the scanning direction and are adjacent to each other, respectively,

wherein said second ejection outlet array group includes a third ejection outlet array for ejecting the first liquid and a fourth ejection outlet array for ejecting the second liquid,

wherein corresponding ejection outlets in said third ejection outlet array and in said fourth ejection outlet array are aligned in the scanning direction, respectively,

wherein volumes of liquid droplets ejected through each of the ejection outlets in said first and second ejection outlet arrays are substantially the same, and

wherein said first ejection outlet array group and said second ejection outlet array group are disposed such that said first ejection outlet array and said third ejection outlet array are adjacent to each other and such that the ejection outlets of said first ejection outlet array and the ejection outlets of said third ejection outlet array are disposed with a deviation in a direction of arrangement of the ejection outlets so as to be complementary to each other in the scanning direction.

23. (Previously Presented) A liquid ejection recording head according to Claim 22, wherein the volumes of the liquid droplets ejected through each of the ejection outlets in said first, second, third and fourth ejection outlet arrays are substantially the same.

24. (Previously Presented) A liquid ejection recording head according to Claim 1, wherein corresponding ejection outlets in said third ejection outlet array and in said fourth ejection outlet array are adjacent to each other.

25. (Previously Presented) A liquid ejection recording head according to Claim 22, wherein corresponding ejection outlets in said third ejection outlet array and in said fourth ejection outlet array are adjacent to each other.

26. (Previously Presented) A liquid ejection head comprising:

first, second and third liquid supply openings arranged in the order named along a predetermined direction;

a first ejection outlet array disposed at one end of said second liquid supply opening with respect to the predetermined direction and including a plurality of ejection outlets which are in fluid communication with said second liquid supply opening;

a second ejection outlet array disposed at one end of said first liquid supply opening with respect to the predetermined direction and including a plurality of ejection outlets which are in fluid communication with said first liquid supply opening;

a third ejection outlet array disposed at the other end of said second liquid supply opening with respect to the predetermined direction and including a plurality of ejection outlets which are in fluid communication with said second liquid supply opening; and

a fourth ejection outlet array disposed at one end of said third liquid supply opening with respect to the predetermined direction and including a plurality of ejection outlets which are in fluid communication with said third liquid supply opening,

wherein said plurality of ejection outlets constituting said first ejection outlet array are in alignment with said plurality of ejection outlets constituting said second ejection outlet array with respect to the predetermined direction,

wherein said plurality of ejection outlets constituting said third ejection outlet array are in alignment with said plurality of ejection outlets constituting said fourth ejection outlet array with respect to the predetermined direction,

wherein said plurality of ejection outlets constituting said first ejection outlet array are deviated relative to said plurality of ejection outlets constituting said third ejection outlet array with respect to a direction in which said ejection outlets are arranged, such that said plurality of ejection outlets constituting said first ejection outlet array and said plurality of ejection outlets constituting said third ejection outlet array are complementary with each other, and

wherein said first liquid supply opening and said third liquid supply opening supply the same liquid.

27. (Previously Presented) A liquid ejection recording head according to Claim 26, wherein said first liquid supply opening and said third liquid supply opening are in fluid communication with a common liquid supply source.

28. (Previously Presented) A liquid ejection recording head according to Claim 26, further comprising a substrate provided with energy generating elements for generating energy usable for ejecting liquid.

29. (New) A liquid ejection recording head for effecting recording while scanning a recording material bi-directionally, said liquid ejection recording head comprising:

first, second and third liquid supply openings provided in a common substrate in the order named in a given direction;

a first ejection outlet array including a plurality of ejection outlets in fluid communication with said second liquid supply opening, said first ejection outlet array being disposed on a side of said second liquid supply opening facing away from the direction;

a second ejection outlet array including a plurality of ejection outlets in fluid communication with said first liquid supply opening, said second ejection outlet array being disposed on a side of said first liquid supply opening facing away from the direction;

a third ejection outlet array including a plurality of ejection outlets in fluid communication with said second liquid supply opening, said third ejection outlet array being disposed on a side of said second liquid supply opening facing the direction;

a fourth ejection outlet array including a plurality of ejection outlets in fluid communication with said third liquid supply opening, said fourth ejection outlet array being disposed on a side of said third liquid supply opening facing the direction;

wherein the ejection outlets of said first ejection outlet array and the ejection outlets of said second ejection outlet array are aligned with each other with respect to the direction;

wherein the ejection outlets of said third ejection outlet array and the ejection outlets of said fourth ejection outlet array are aligned with each other with respect to the direction;

wherein the ejection outlets of said first ejection outlet array and the ejection outlets of said third ejection outlet array are offset from each other with respect to the direction

so as to supplement each other with respect to a direction in which the ejection outlets are arranged; and

wherein a same kind of liquid is supplied through said first liquid supply opening and said third liquid supply opening.